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EDITORIAL - I

ROLE OF DOPPLER ULTRASONOGRAPHY INTRAUTRINE GROWTH RESTRICTION

Since its introduction in 1970s Doppler ultrasound use in obstetrics has emerged as an important tool in both the evaluation and management of many pregnancy related pathological conditions such as Intrauterine Growth restriction, pre-eclampisa, foetal hypoxia and foetal anaemia. Doppler ultrasonography is based on the concept of Doppler effect, which is nothing but shift in frequency that occurs when a sound wave generating or reflecting source and an observer move relative to each other. The indices most commonly used to express the Doppler effect in pregnancy are the systolic-to-diastolic (S/D) ratio, pulsatility index (PI), and resistance index (RI).

Intrauterine Growth Restriction (IUGR) is a complex, muultifactorial condition which affects 3-10% of all pregnancies IUGR increases the perinatal mortality and morbidity and evidence suggests that it has long-term health consequences such as increased risk of hypertension, cardiovascular diseases, diabetes. Amongst all etiologies of IUGR, plovertal insufficiency is the single most important final common pathway leading to impaired oxygen and nutrient transport to the foetus. Doppler ultrasound is primarily useful in fetuses whose growth restriction results from plovertal insufficiency.

In normal healthy pregnancies placenta transitions to a low resistance and high flow organ as the process of trophoblastic invasion completes early in the second trimester. As a result low resistance umbilical artery exhibits continuous forward flow throughout cardiac cycle. In pathological conditions such as IUGR there are pattern of changes in umbilical artery (UA) end-diastolic velocity that shows increased placental resistance. Initially there is reduced end diastolic flow followed by absence of flow and finally reversal of flow, which occurs when more than 70% of villi are damaged and indicates severe placental compromise. In fetuses with suspected IUGR surveillance with UA Doppler velocimetry reduces the rate of antenatal admissions and caesarean delivery for foetal distress. At the same time, use of UA Doppler ultrasound in pregnancies with suspected IUGR improves perinatal outcome The foetus when challenged with continuous placenta! insufficiency adapts by diverting more blood to vital organs like cerebral circulation which is normally a high

imipedence system. But when hypoxia ensues compensatory vasodilation occurs in the brain. In foetuses with IUGR Doppler study of middle cerebral artery (MCA) in contrast to UA shows decreased resistance indices. MCA peak systolic velocity {PSV) is a better predictor of perinatal mortality than pulsatilety index. Another important tool to predict perinatal mortality in a foetus with IUGR is cerebroplacental ratio (MCA pulsatilety index /UA pulsatilety index). Doppler study of foetal venous circulation reflects foetal cardiac function and most commonly studied veins include ductus venosus (DV), inferior vena cava. hepatic vein, intra-abdominal portion of umbilical vein. Venous vessels exhibit a pulsatile tri-phasic waveform representing flow during systole (S wave), flow during diastole (D wave), and atrial systole (a-wave); exception is umbilical vein which exhibits a non-pulsatile flow under normal conditions. In response to hypoxia there is increased putsatility index for veins (PIV). With increase in foetal hypoxia leading to acidosis the a-wave become reversed ("reversed a-wave"). This eventually leads to pulsations within intra-abdominal umbilical vein (lAUV) and reversal of flow in the inferior vena cava. These last two alterations represent foetal right heart faliure and fetal metabolic acidosis which indicates high risk for the foctus.

Doppler ultrasound is very useful in diagnosing foetal lUGR. Abnormal Doppler waveforms typically appears prior to clinical and other laboratory manifestations of these conditions allowing for earlier identification and surveillance.

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